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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/477,101	01/04/2000	LINDEN A. DECARMO	N0003/7030	8713

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EXAMINER
ALI, SYED J

ART UNIT	PAPER NUMBER
2127	

DATE MAILED: 07/30/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>20 May 2003</u> .

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) <u>1-19</u> is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) <u>1-19</u> is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

    If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All b)☐ Some * c)☐ None of:

        1.☐ Certified copies of the priority documents have been received.

        2.☐ Certified copies of the priority documents have been received in Application No. _____ .

        3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

14)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

    a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .

4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: .

DETAILED ACTION

1.   This office action is in response to Amendment A, paper number 8, which was received May 20, 2003. Applicant's arguments have been fully considered but they deemed to be moot in view of the new ground of rejection. Claims 1-19 are presented for examination.

2.   The text of those sections of Title 35, U.S. code not included in this office action can be found in a prior office action.

Claim Rejections - 35 USC § 112

3.   Claims 3, 8-9, 14, 18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 3 contains grammatical errors in line 2 rendering the claim indefinite.

Claim 8 recites the limitation "the plurality of threads" in lines 7-9, and 12. There is insufficient antecedent basis for this limitation in the claim.

Claim 9 recites the limitation "the plurality of threads" in lines 2-3. There is insufficient antecedent basis for this limitation in the claim.

Claim 14 recites the limitation "the plurality of threads" in line 4. There is insufficient antecedent basis for this limitation in the claim.

Claim 18 recites the limitation "the plurality of threads" in lines 4 and 6. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 101

4.   35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

5.   Claim 15 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Specifically, an apparatus claim must reference something tangible therein, e.g., some sort of hardware. Claim 15 recites only an apparatus comprising software modules used in a computer system, such as a call flow engine, call flow manager, and call flow event queues.

Claim Rejections - 35 USC § 103

6.   Claims 1-5, 7-12, 14-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sudo (USPN 5,692,192) in view of Chang et al. (USPN 6,338,078) (hereinafter Chang).

As per claim 1, Sudo discloses in a computer system, a method, performed at a manager (col.. 7 line 60 - col. 8 line 11, "threads are transferred from a heavily loaded node to a lightly

loaded node using a thread transfer mechanism provided in an operating system"), of distributing call flow events among a plurality of threads (col. 1 lines 14-26, "The threads are units to which processor resources are allocated"), the method comprising:

    a.   determining a call flow workload level for each of the plurality of threads (col. 5 lines 10-22, "load information of each information processing apparatus is collected as in the conventional load distribution method");

    b.   determining that a first of the plurality of threads is inefficiently handling its assigned call flow workload (col. 5 lines 10-22, "it is determined if the load information of each information processing apparatus collected in step S1 is equal"); and

    c.   reassigning a call flow event from the call flow event queue associated with the first thread to the call flow event queue associated with a second of the plurality of threads (col. 5 lines 10-22, "threads within the distributed task in operation are transferred from a heavily loaded node to a lightly loaded node").

Sudo does not specifically disclose each thread having an associated call flow event queue in which call flow events are queued. Also, it is noted that in step c above, the reassigning of call flow events is not related to reassigning of call flow events among event queues, per se. Rather, the reassigning is of threads among processing nodes. However, the disclosure of Chang does disclose balancing of call flow events among call flow event queues, as will be discussed below.

Chang discloses each thread having an associated call flow event queue in which call flow events are queued (col. 2 line 54 - col. 3 line 6, "Packets received on the network are distributed to N high priority threads, wherein N is the number of CPUs on the system. N queues

are provided to which the incoming packets are distributed", wherein there is one queue for each thread). Furthermore, Chang discloses the balancing of packet flow among the N threads through the use of a hashing function. However, this is not a dynamic balancing of call flow, but rather a preliminary sorting of packets to balance the load prior to execution. This still has the drawback of not allowing a rebalancing of the thread queue's workload once execution has started.

Thus, it would have been obvious to one of ordinary skill in the art to combine Sudo and Chang since Sudo discloses a method that allows rebalancing of workload from a heavily loaded node to a lightly loaded node, thereby increasing the throughput of the system. However, this rebalancing is concerned with the entire thread of execution, and does not mention that the thread should have a queue associated with it. Chang makes up for this deficiency by allowing each thread to be assigned to a specific CPU, and each having a queue associated with it for balancing workload. However, the workload balancing is not dynamically responsive to changes in workload. Thus, the method of Sudo could be applied by rebalancing the workload of each thread by redistributing packets from a heavily loaded node (or thread) to a lightly loaded node (or thread).

As per claim 2, Chang discloses the method according to claim 1 further comprising the step:

d.   processing the call flow events associated with each of the plurality of threads (col. 2 line 54 - col. 3 line 6, "When one of the queues is started, one of the threads is scheduled to process packets on this queue").

As per claim 3, Sudo discloses the method according to claim 1 wherein step c. further comprises:

c1.　removing a call flow event from the call flow event queue associated within the first thread (col. 5 lines 10-22, "threads within the distributed task in operation are transferred from a heavily loaded node to a lightly loaded node"); and

c2.　placing the removed call flow event in the call flow event queue associated with the second thread (col. 5 lines 10-22, "threads within the distributed task in operation are transferred from a heavily loaded node to a lightly loaded node");.

It is noted that the reassigning therein is not specifically related to call flow event queues. However, this deficiency is made up for in the disclosure of Chang, as discussed above in reference to claim 1, and for the remainder of this Office Action, the reallocation of threads disclosed in Sudo will be considered applicable to reallocation of events among queues as well, as discussed in reference to claim 1.

As per claim 4, Sudo discloses the method according to claim 1 wherein step c. further comprises:

c1.　selecting the second thread in accordance with the number of call flow events in the call flow event queue associated with the second thread (col. 5 lines 10-22, "threads within the distributed task in operation are transferred from a heavily loaded node to a lightly loaded node", wherein the selection of the second node to transfer the thread is to is determined by its workload).

As per claim 5, Sudo discloses the method according to claim 1 wherein step c further comprises:

c1.   allocating the call flow events to a thread within the computer system with the least call flow load (Fig. 6, col. 5 lines 10-22, "threads within the distributed task in operation are transferred from a heavily loaded node to a lightly loaded node", wherein Fig. 6 shows how the redistribution of tasks balances threads by taking threads from the most heavily loaded node and transfers them to the most lightly loaded node).

As per claim 7, Chang discloses the method according to claim 1, wherein step A comprises:

a1.   assigning call flow events among the call flow queues associated with the respective plurality of threads in the system (col. 2 line 55 - col. 3 line 6, "Packets are distributed to one of the N queues by using a hashing function").

As per claim 17, Sudo discloses the method according to claim 1, further comprising:

d.   determining whether a call flow balance has been achieved among the plurality of threads (col. 5 lines 10-22, "In step S2, it is determined if the load information of each information processing apparatus collected in step S1 is equal", wherein the redistribution of threads continues until a balance has been achieved); and

e.   Chang discloses processing the call flow events associated with each of the plurality of threads (col. 2 line 54 - col. 3 line 6, "When one of the queues is started, one of the threads is scheduled to process packets on this queue").

As per claims 8-12, 14, and 18, they are rejected for similar reasons as stated for claims 1-5, 7, and 17 above, respectively. Specifically, a computer program product having a computer usable medium having program code embodied in the medium, operable to perform the method of claims 1-5, 7, and 17 is disclosed by both Sudo and Chang (see Figs. 1 and 2 of Chang, see Figs. 1 and 2 of Sudo).

As per claims 15-16, they are rejected for similar reasons as stated for claims 1-2 and 17 above. Specifically, all of the limitations recited in claims 15-16 are similar to limitations in claims 1-2 and 17. Furthermore, the combination of Sudo and Chang discloses an apparatus adapted to perform the method of claims 1-2 and 17 (see Figs. 1-2 of Chang).

7.   Claims 6, 13, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sudo in view of Chang in view of Boland et al. (USPN 5,872,972) (hereinafter Boland).

As per claim 6, the modified Sudo does not specifically disclose the method according to claim 1 wherein step b comprises:

b1.   determining whether the number of call flow events in the call flow event queue associated with a thread has exceeded a predetermined criteria.

Boland discloses determining whether the number of call flow events in the call flow event queue associated with a thread has exceeded a predetermined criteria (col. 3 lines 6-20, "The improved affinity process scheduling method also monitors the processing load borne by the affined processor, determines therefrom a headroom parameter for the affined processor, the headroom parameter indicating the remaining load capacity of the affined processor; and schedules the affined process for execution with another available processor when the headroom of the affined processor is less than a predetermined 'low-headroom' threshold").

It would have been obvious to one of ordinary skill in the art to add Boland to the modified Sudo since Boland allows for limiting the number of call flow events within a specific queue, thereby implementing a prevention of an overload condition. If such an overload condition does occur, the migration method of Sudo could be applied by moving call flow events from the heavily loaded processing node (or thread) to a lightly loaded processing node (or thread). This provides an added benefit of not only dynamically balancing the workload of various processing nodes, but also preventing overload conditions.

As per claim 13, it is rejected for similar reasons as stated for claim 6 above. That is, a computer readable medium having computer program code embodied therein is disclosed by the combination of Sudo, Chang, and Boland as discussed in reference to claims 8-12, 14, and 18 above.

As per claim 19, it is rejected for similar reasons as stated for claims 6 above. Specifically, all of the limitations recited in claim 19 are similar to limitations in claim 6.

Furthermore, the combination of Sudo, Chang, and Boland discloses an apparatus adapted to perform the method of claims 6 (see Figs. 1-2 of Chang).

Response to Arguments

8.   Applicant's arguments are directed primarily toward the fact that the previously cited prior art does not disclose a centralized approach to load balancing. It is hereby acknowledged that the previous primary reference, Liu et al. (USPN 5,031,089) (hereinafter Liu) did indeed take on a decentralized approach. However, Liu also discusses the fact that a centralized approach is the more common technique (col. 8 lines 8-42, "most of the work of the prior art has been limited to either static schemes, centralized control, or homogeneous systems"). Examiner thus conducted an updated search and found more appropriate prior art that takes on a centralized approach, as discussed above. The combinations of references used in the rejection above do in fact teach all of the limitations of the claimed invention. Therefore, in view of the new grounds of rejection, the claims as presently set forth stand unpatentable over the combination of Sudo and Chang, as well as the combination of Sudo, Chang, and Boland.

Conclusion

9.   The prior art made of record and not relied upon is considered pertinent to applicant's

disclosure.

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Syed J Ali whose telephone number is (703) 305-8106. The

examiner can normally be reached on Mon-Fri 8-5:30, 1st Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, William A Grant can be reached on (703) 308-1108. The fax phone numbers for the

organization where this application or proceeding is assigned are (703) 746-7239 for regular

communications and (703) 746-7238 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding

should be directed to the receptionist whose telephone number is (703) 305-3900.

Syed Ali
July 15, 2003
                                                                MAJID BANANKHAH
                                                                PRIMARY EXAMINER